

22/07/03

11:27

PATENTANWÄLTE SIEGEN + 718 601 1099

NR. 360

D13

22593

We claim:

1 1. A method of controlled application of fluid
2 pressure to a load, comprising the steps of:

3 (a) providing at least two pressure converters each
4 having an output side connectable through respective check valves
5 with a source of a pressurizing fluid and with said load, a drive
6 side pressurizable in opposite directions to draw said fluid into
7 and discharge said fluid from a respective output side, and a
8 connection between each pressure side and the respective output
9 side whereby each pressure converter has a member displaceable by
10 pressurization of the respective drive side;

11 (b) measuring the displacement of each of said members;
12 and

13 (c) controlling the pressurization of each of said
14 drive sides so as to reduce an output pressure of a respective
15 output side of one of said pressure converters as the respective
16 member approaches a limiting position in a pressure stroke of
17 said one of said pressure converters, and complementarily
18 increasing an output pressure of a respective output side of
19 an other of said pressure converters and a displacement of the
20 respective member of said other pressure converter by initiating
21 a pressure stroke of said other pressure converters.

22/07/03

11:27

PATENTANWÄLTE SIEGEN + 718 601 1099

NR.360

D14

22593

1 2. The method defined in claim 1 wherein the
2 pressurization of said drive sides is controlled through
3 respective valves and a common controller for said valves
4 receiving inputs from respective position sensors responding to
5 the positions of said members, said method further comprising the
6 step (d) of repeating steps (a) through (c) a plurality of times
7 until a certain pressure is reached at said load.

1 3. The method defined in claim 2 wherein said load is
2 a length of pipe which closed at its ends and is pressurized by
3 said pressure converters to test the pipe.

1 4. The method defined in claim 3 wherein only two of
2 said pressure converters are provided and are alternately
3 op rated to charge said pipe with said fluid.

1 5. A system for controlled application of fluid
2 pressure to a load, comprising:
3 at least two pressure converters each having an output
4 side connectable through respective check valves with a source of
5 a pressurizing fluid and with said load, a drive side
6 pressurizable in opposite directions to draw said fluid into and

22/07/03

11:28

PATENTANWÄLTE SIEGEN → 718 601 1099

NR. 360

D15

22593

7 discharge said fluid from a respective output side, and a
8 connection between each pressure side and the respective output
9 side whereby each pressure converter has a member displaceable by
10 pressurization of the respective drive side;

11 a respective displacement measuring device cooperating
12 with each of said members for measuring the displacement of each
13 of said members; and

14 a common control unit for controlling the
15 pressurization of each of said drive sides so as to reduce an
16 output pressure of a respective output side of one of said
17 pressure converters as the respective member approaches a
18 limiting position in a pressure stroke of said one of said
19 pressure converters, and complementarily increasing an output
20 pressure of a respective output side of another of said pressure
21 converters and effecting a displacement of the respective member
22 of said other pressure converter by initiating a pressure stroke
f said other pressure converters.

1 6. The system defined in claim 5 wherein the
2 pressurization of said drive sides is controlled through
3 respective valves and a common controller for said valves forming
4 said control unit and receiving inputs from respective
5 displacement measuring devices responding to the positions of
6 said members, the pressure strokes being repeated until a certain
7 pressure is reached at said load.

22/07/03 11:28 PATENTANWÄLTE SIEGEN → 718 601 1099

NR. 360 D16

22593

1 7. The system defined in claim 6 wherein said load is
2 a pipe closed at its ends and is used to pressure test said pipe.

1 8. The system defined in claim 7 wherein said output
2 sides are connected to said pipe through a valve enabling
3 draining of said pipe following a test.

1 9. The system defined in claim 7, further comprising a
2 proportional/integral regulator between said output sides and
3 said pipe for delivering a signal to said common controller.

1 10. The system defined in claim 7 wherein each of said
2 pressure converters has at said drive side a respective double-
3 acting cylinder and a piston, each of said output sides has a
4 respective cylinder and piston and the respective member of each
5 of said pressure converters connects the pistons to the cylinders
6 thereof.

1 11. The system defined in claim 10 wherein each of
2 said members is a rack and said displacement measuring devices
3 include pinions engageable with said racks.

22/07/03 11:28 PATENTANWÄLTE SIEGEN → 718 601 1099

NR. 360 D17

22593

1 12. The system defined in claim 11 wherein each of
2 said double-acting cylinders is connected to two ports of a four-
3 port, three position valve having two further ports connected to
4 a hydraulic pressure source and drain respectively, each of said
5 further-ports, three-position valves having an electrical actuator
6 operated by said common controller.